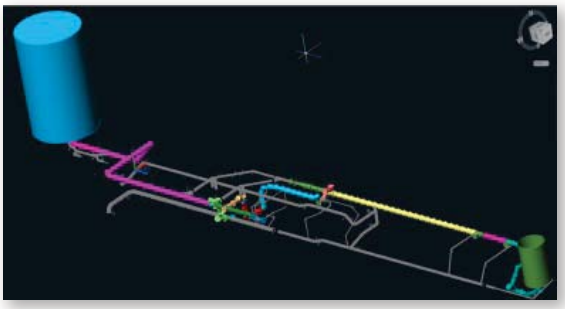
Advanced Ground Systems Maintenance Physics Models For Diagnostics Project

Ground Systems Development And Operations Program

Human Exploration And Operations Mission Directorate (HEOMD)

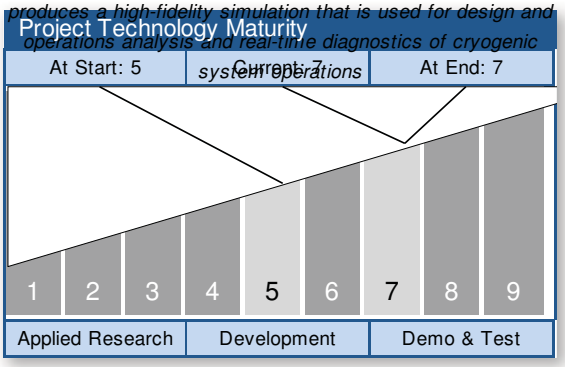
National Aeronautics and Space Administration



ABSTRACT

The project will use high-fidelity physics models and simulations to simulate real-time operations of cryogenic and systems and calculate the status/health of the systems. The project enables the delivery of system health advisories to ground system operators. The capability will also be used to conduct planning and analysis of cryogenic system operations.

Physics model of Simulated Propellant Loading System produces a high-fidelity simulation that is used for design and operations analysis and real-time diagnostics of cryogenic system operations



Technology Area: Ground & Launch Systems Processing TA13 (Primary)
Robotics, Tele-Robotics & Autonomous Systems TA04 (Secondary)

ANTICIPATED BENEFITS

To NASA funded missions:

Reduces trouble-shooting time during system operation and can also be used as an enginering analysis tool during the design phase. Provides the capability to conduct subsystem assessment of known, undetectable system failure modes. Provides capability to assess the system design and identify the optimal placement of sensors to optimize the ability to detect known fault modes. Can be used to enable autonomous system operations.

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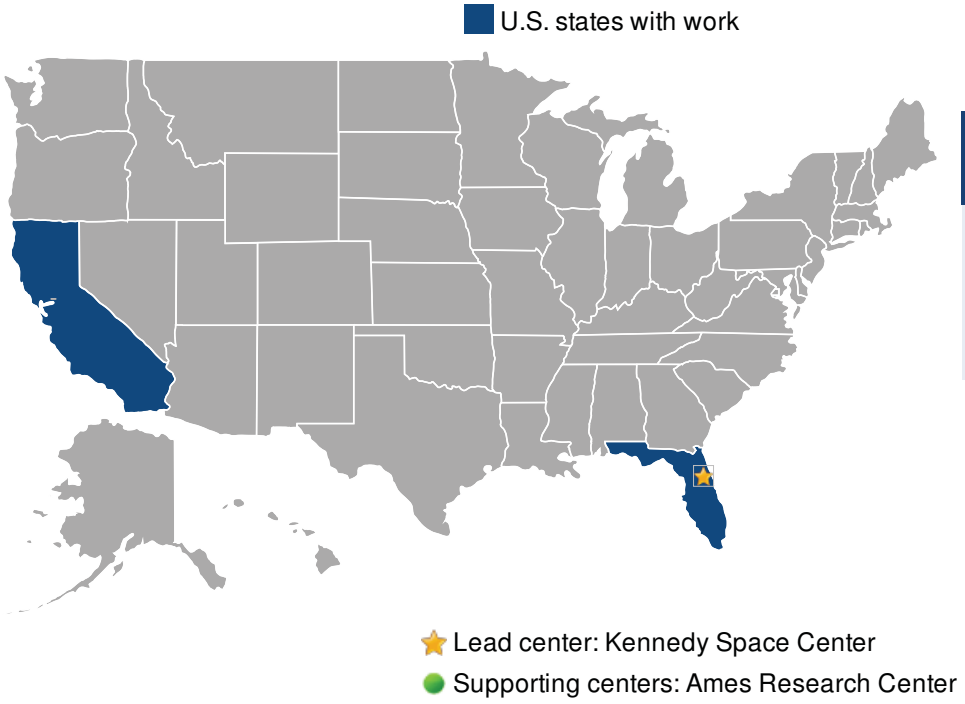
Read more on the last page.



Other Organizations Performing Work
ABACUS / ITSS
QinetiQ North America
Stinger Ghaffarian Technologies

DETAILED DESCRIPTION

The project will use high-fidelity physics models and simulations to simulate real-time operations of cryogenic and systems and calculate the status/health of the systems. The project enables the delivery of system health advisories to ground system operators. The capability will also be used to conduct planning and analysis of cryogenic system operations.

MANAGEMENT

Program Executive:
Michael Bolger

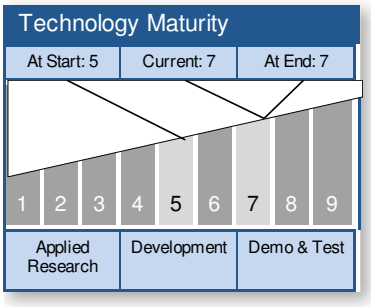
Program Manager:
Kirk Lougheed

Project Manager:
Kirk Lougheed

Principal Investigator:
Barbara Brown

TECHNOLOGY DETAILS

Advanced Ground Systems Maintenance Physics Models for Diagnostics



TECHNOLOGY DESCRIPTION

The project will use high-fidelity physics modeling techniques to simulate real-time operations of cryogenic systems and calculate the status/health of the systems. 1st order principles are used to represent thermal, mass and fluid properties and their interaction within the system to simulation system function. During system operation, simulated measures are compared to system data and used to identify off-nominal trends, diagnose failures and identify options for maintaining or restoring system function.

This technology is categorized as a software macro for engineering, design, modeling, or analysis

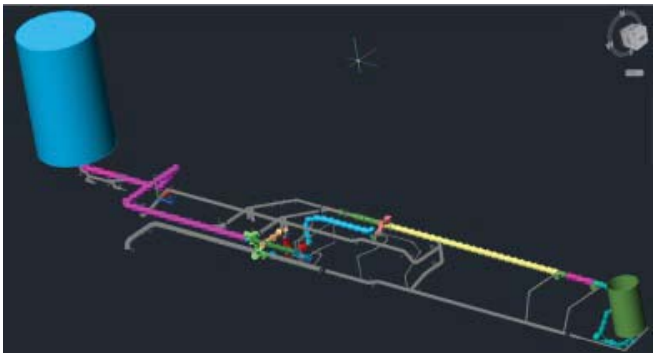
- Technology Area
    - TA13 Ground & Launch Systems Processing (Primary)
    - TA04 Robotics, Tele-Robotics & Autonomous Systems (Secondary)
    - TA06 Human Health, Life Support & Habitation Systems (Additional)

CAPABILITIES PROVIDED

High-fidelity physics models that simulate real-time operations of cryogenic systems and calculate the status/health of the systems. Planning and analysis tool for cryogenic system operations.

Can support requirements to train personnel on system function in nominal and off-nominal operation.

IMAGE GALLERY



Physics model of Simulated Propellant Loading System produces a high-fidelity simulation that is used for design and operations

ANTICIPATED BENEFITS

To NASA unfunded & planned missions: (CONT'D)

Reduces trouble-shooting time during system operation and can also be used as an enginering analysis tool during the design phase. Provides the capability to conduct subsystem assessment of known, undetectable system failure modes. Provides capability to assess the system design and identify the optimal placement of sensors to optimize the ability to detect known fault modes. Can be used to enable autonomous system operations.

To the commercial space industry:

Reduces trouble-shooting time during system operation and can also be used as an enginering analysis tool during the design phase. Provides the capability to conduct subsystem assessment of known, undetectable system failure modes. Provides capability to assess the system design and identify the optimal placement of sensors to optimize the ability to detect known fault modes. Can be used to enable autonomous system operations.